



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

Address: COMMISSIONER FOR PATENTS

P.O. Box 1450

Alexandria, Virginia 22313-1450

www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/580,491	05/23/2006	Horst Vestweber	14113-00012-US	2381
23416 7590 05/24/2010 CONNOLLY BOVE LODGE & HUTZ, LLP P O BOX 2207 WILMINGTON, DE 19899				
EXAMINER				
CLARK, GREGORY D				
ART UNIT		PAPER NUMBER		
1786				
MAIL DATE		DELIVERY MODE		
05/24/2010		PAPER		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/580,491

Applicant(s)

VESTWEBER ET AL.

Examiner

GREGORY CLARK

Art Unit

1786

Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 March 2010.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-31 is/are pending in the application.
- 4a) Of the above claim(s) 11 and 27 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10, 12-26 and 28-31 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/S508)
- 4) ☐ Interview Summary (PTO-413)
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

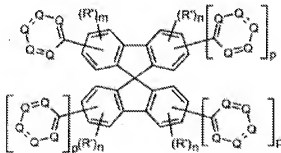
The examiner acknowledges the receipt of the applicants' amendments and arguments dated 03/22/2010. Claims 1-10, 12-26 and 28-31 pending.

Rejections and objections made in previous office action that do not appear below have been overcome by applicant's amendments and therefore the arguments pertaining to these rejections/objections will not be addressed.

Claim Rejections - 35 USC § 102

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

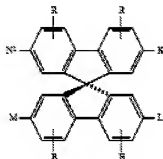
1. **Claims 22-26 and 28-30 are rejected under 35 U.S.C. 102(b) as being anticipated by Lupo (US 5,840,217).**
2. **Regarding Claims 22-24**, applicant claims the compound represent by Formula 2 (shown below):



Formula 4

Art Unit: 1786

Lupo discloses formula L-1

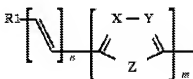


where the symbols and indices have the following meanings:

X, L, M, N are identical or different and are

L-1

Where M-N-L-K can be represented by formula L-1c (column 2)

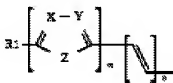


and $R = H$, $n = 0$, $m = 1$, $X = N$, $Y = N$, $Z = CH=N$, formula L-1c is a 1,2,4-triazine (per claims 22- 23) that reads on the applicant formula 2 when $p = 1$ and $R' = H$.

Formula L-1 shows that R can be identical or different; when $m = 0$ in applicants' formula 2, one of the R positions in Lupo's L-1 is H (per claim 24) (column 2 lines 16-31).

3. **Regarding Claim 25**, Lupo's formula L-1 (above) show that two triazine units can be bonded to the same fluorene sub-unit of the spirobifluorene.

4. **Regarding Claim 26 and 28**, Lupo's formula L-I/L-Ic where m and n can be 1-3 (polymer) (column 3, line 27) (per claim 26). Lupo also discloses that the spiro compound can be used in an OLED (abstract) (per claim 28).
5. **Regarding Claim 29**, Lupo discloses that the spiro compound can be used in an OLED in a light emitting diode (column 1, line 20).
6. **Regarding Claim 30**, Lupo shows formula L-1a (below) contains the Z group that links the spirobifluorene unit to the heterocyclic group. The Z group in formula L-1a is the C=C (conjugated radical, 2 carbons, even number).



L-1a

Formula L-1a show R1 (non-adjacent group) that can be replaced by NR2R3 (column 3, 16-33).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. **Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lupo (US 5,840,217).**

8. **Regarding Claim 31**, Lupo teaches the invention of claim 22 and shows 1,2,4-triazine but not 1,3,5-triazine functionality.

The 1,2,4-triazine and 1,3,5-triazine functionality are considered as structural isomers that would have similar properties in an OLED since both represent a nitrogen atom containing heteroaromatic species.

As Lupo discloses 1,2,4-triazine derivatives used in an OLED, it would have been obvious to a person of ordinary skill in the art at the time of the invention to have a variety of compounds including 1,3,5-triazine derivatives which reads on applicants' limitation with the expectation that such materials would function in a similar capacity, absent unexpected results.

9. **Claims 1-4, 4-6, 14-17 and 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oshiyama (US 2003/0198831).**

10. **Regarding Claim 1**, applicant claims an organic electroluminescent device (OLED) containing an anode, a cathode and an emission layer, consisting of at least one matrix material which is doped with at least one phosphorescent emitter, characterized in that a hole-blocking layer which comprises a compound of the formula (1):



(Formula 1)

Wherein Q is N or CR and Q is at least two and a maximum of four nitrogen atoms and R can be an aromatic group. The applicant further claims a compound with NR¹ where R¹ can be a hydrogen atom.

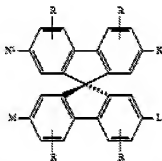
Wherein compounds of the formula (1), a 9,9'-spirobifluorene derivative, a 9,9-disubstituted fluorene derivative, a 6,6- and/or 12,12-di- or tetrasubstituted indenofluorene derivative, a tetraarylmethane derivative or a triptycene derivative is present in at least one of the radicals R, R does not contain a phenylpyridine

Oshiyama discloses an organic electroluminescent device (OLED) that contains a light emission layer (emission layer), a hole blocking layer, an anode and a cathode (paragraph 59). The light emission layer contains a host material (matrix material) and a phosphorescent compound (dopant) (abstract). The hole blocking layer can be made of materials that include pyrimidine derivatives (Q is 2) or triazine derivatives (Q is 3) (paragraph 70). The hole blocking layer is located between the light emitting layer and the cathode (paragraph 61).

Oshiyama fails to mention a pyrimidine or triazine derivative which is a 9,9'-spirobifluorene derivative, a 9,9-disubstituted fluorene derivative, a 6,6- and/or 12,12-di- or tetrasubstituted indenofluorene derivative, a tetraarylmethane derivative or a triptycene derivative.

Lupo discloses triazine functional spirobifluorene compounds used in an OLED (abstract). Lupo further discloses that the spiro compounds can be used as charge injection or charge transport for positive (holes) charges and negative (electrons) charges (column 24, lines 35-40).

Lupo discloses 9,9'-spirobifluorene compounds represented by Formula L-1

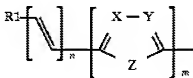


where the symbols and indices have the following meanings:

K, L, M, N are identical or different and are

L-1

Where M-N-L-K can be represented by formula L-1c (column 2)



and R1 = H, n = 0, m=1, X=N, Y= N, Z is CH=N- which results in a 9,9' spirodifluorene triazine function compound. Z can also be a C atom which results in a pyrimidine group.

The examiner notes that a triazine group shows three nitrogen atoms and the pyrimidine group shows two nitrogen atoms while applicant claims at least two nitrogen atoms.

It would have been obvious to a person of ordinary skill in the art at the time of the invention to have selected from known pyrimidine derivatives or triazine derivatives with more than one heterocyclic ring used in an active layer of an OLED which would have included the compounds of Lupo that reads on the instant limitations, absent unexpected results.

11. **Regarding Claims 4-6**, Oshiyama discloses that pyrimidine derivatives or triazine derivatives can be used for the hole-blocking layer (abstract) (per claims 4 and 5). The triazine derivatives would be inclusive of 1,2,4-triazines and 1,3,5-triazines (per claim 6).
12. **Regarding Claim 15**, Oshiyama discloses an OLED where a carbazole derivative is used as the host material (matrix material) (paragraph 8).
13. **Regarding Claim 2**, Oshiyama discloses that the device contains an electron transporting layer (abstract).
14. **Regarding Claims 16-17**, Oshiyama discloses that the phosphorescent dopant materials can be an iridium complex (contains Ir atomic number 77, per claims 16-17) (paragraph 16).

15. **Regarding Claim 3**, Oshiyama discloses that the OLED that has a hole blocking layer (paragraph 59) but fails to mention what percentage is present. The applicant claims at least 50% of the compounds represented by Formula 1.

Oshiyama further mentions that the hole blocking layer can efficiently accumulate holes in the light emission layer and improve a recombination probability of electrons and holes, resulting in light emission with high efficiency (paragraph 7).

It would have been obvious to a person of ordinary skill in the art at the time of the invention would have adjusted the percentage of the pyrimidine derivative or triazine derivative (reads on applicants' formula 1) in the hole-blocking layer to improve the recombination probability of electrons and holes, resulting in light emission with high efficiency which would have included the claimed range, absent unexpected results.

16. **Regarding Claim 14**, Oshiyama discloses that the OLED has a hole blocking layer (abstract) but fails to mention the thickness of the hole blocking layer. The applicant claims a thickness of 1 to 50nm.

Oshiyama further mentions that the hole blocking layer can efficiently accumulate holes in the light emission layer and improve a recombination probability of electrons and holes, resulting in light emission with high efficiency (paragraph 7).

It would have been obvious to person of ordinary skill in the art at the time of the invention to have adjusted the thickness of the hole-blocking layer to optimize the emission efficiency which would have included the range claimed by the applicant, absent unexpected results.

17. **Regarding Claim 18-20**, Oshiyama discloses that the layers can be made by vacuum deposition (paragraph 64) but fails to mention sublimation and printing.

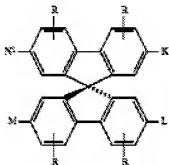
Oshiyama and Lupo teach the invention of claim1 but fail to teach each coating process claimed by the applicant. Whereas the applicant is claiming the OLED and not the process claims 18-20 are considered as product by process claims in which the process is not considered for patentability.

It would have been obvious to a person of ordinary skill in the art at the time of the invention to have selected from known coating methods which would have included those claimed by the applicant, absent unexpected results.

18. **Claims 7-10, 12 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oshiyama (US 2003/0198831) in view of Lupo (US 5,840,217).**

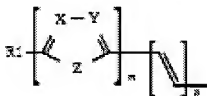
19. **Regarding Claims 7 and 12**, Oshiyama discloses that pyrimidine derivatives or triazine derivatives can be used for the hole-blocking layer (abstract). Oshiyama fails to mention the number of heterocyclic units present in the molecule. The applicant claims more than one unit.

Lupo discloses spiro compounds used in OLED(s) (abstract) that can contain more than one unit of applicants' formula 1. The spiro compound of Lupo is represented by formula L-1 and L-1a (Column 2):



where the symbols and indices have the following meanings:
 K, L, M, N' are identical or different and are

L-1



L-1a

Where R can be H; Z can be $-\text{CN}=\text{N}-$; X and Y can be N; n and m can be 0, 1, 2 or 3,
 R1 can be alkyl 1-22 carbons (column 3, lines 15-33).

The combination of X, Y and Z in formula L-1a can produces pyrimidine derivatives or triazine derivatives which are heterocyclic materials that read on the applicants' formula 1.

Since Oshiyama and Lupo discloses pyrimidine derivatives or triazine derivatives an OLED and the electronic properties of such materials was also known at the time of the invention, the pyrimidine derivatives or triazine derivatives of Oshiyama and formula L-1/L-1a of Lupo are considered as functional equivalent and readily exchangeable.

It would have been obvious to a person of ordinary skill in the art at the time of the invention to have selected from known pyrimidine derivatives or triazine derivatives

with more than one heterocyclic ring which would have included the compounds of Lupo that reads on the instant limitations, absent unexpected results.

Formula L-1 from Lupo is a 9,9' spirobifluorene compound (per claim 12).

20. **Regarding Claims 8-10**, The pyrimidine derivatives and triazine derivatives of Oshiyama used in the hole blocking layer being exchangeable with the spiro compounds of Lupo was discussed in section 19.

Lupo also discloses the spiro compound represented by formula L-1 and L-1a (Column 2) (above). R1 of formula L-1a can be a branched alkyl group (column 3, line 20) which is inclusive of a tert-butyl group that is non-planar (per claim 8), sp³ hybridized (per claim 9) and contains a quaternary carbon (per claim 10).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to have made a series of compounds with varied R1 groups to determine the effect on solubility and coatability which would have included a tert-butyl group that reads on the applicants' limitations, absent unexpected results.

21. **Regarding Claim 21**, Oshiyama discloses an OLED but fails to mention the use as a light emitting diode.

Lupo discloses that the OLED can be used as a light emitting diode (column 1, line 20).

As Oshiyama and Lupo both disclose OLED(s) made from related materials, it would have been obvious to a person of ordinary skill in the art at the time of the

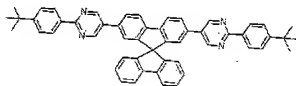
invention to have used the OLED of Oshiyama based on the guidance of Lupo as a light emitting diode.

22. **Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Oshiyama (US 2003/0198831) in view of Lupo (US 5,840,217) and further in view of Wu (Applied Physics Letters, 2002, vol. 81, no 4, p. 577-579).**

23. **Regarding Claim 13,** The pyrimidine derivatives and triazine derivatives of Oshiyama used in the hole blocking layer being exchangeable with the spiro compounds of Lupo was discussed in section 19.

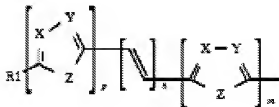
Lupo also discloses a spirobifluorene pyrimidine derivative conjugated oligomer (m and n can be 1-3, polymeric, column 3, line 27) in an organic luminescent device (OLED). Lupo fails to mention the T_g of the spiro compound L-1/L-1a.

Wu shows that a spirobifluorene-based pyrimidine (W-1) has a T_g of 195°C (page 577).



W-1

Lupo further discloses that formula L-1 (above) can be substituted in the K-L-M-N position with formula L-1b (below):



Where m, n or p 0, 1, 2 or 3;

Ring 1 (left) [R1 of formula L-1a can be a branched alkyl group (column 3, line 20) which is inclusive of a tert-butyl group; x and y can be CR (R = H) and Z can be CH=CH]

Ring 2 (middle) [n=0] (removed)

Ring 3 (right) [x = N, y = CR, and Z can be CH=N-] (column 3, lines 15-33).

Given that the compounds disclosed by Lupo are higher molecular weight yet similar to those claimed by the applicant. The examiner takes the position the compounds L-1/L-1b would also have a Tg greater than 100 deg C.

Response to Amendment

Applicant argues that Lupo fails to show any triazine compound in Table 1.

The examiner counters that applicants' Formula 2 show generic heterocyclic rings and Formula L-1a of Lupo is also a generic heterocyclic structure. Formula L-1a can contain three nitrogen atoms as part of a six-membered ring heterocycle which is defined as a triazine. While Lupo does not disclose a triazine as the preferred embodiment, the generic teaching is clearly inclusive of applicants' invention.

Applicant argues that Oshiyama does not disclose a 9,9'-spirobifluorene derivative.

The examiner counter that Oshiyama discloses that the hole blocking layer can be made from pyrimidine derivatives or triazine derivatives. These derivatives are considered as readily exchangeable with the pyrimidine and triazine derivatives disclosed by Lupo that read on applicants' limitations as discussed in section 10.

The combination of Oshiyama and Lupo would have been obvious based the teaching of Oshiyama which specifically teaches pyrimidine and triazine derivatives used in a hole blocking layer. Additionally, pyrimidine and triazine heterocyclic groups are common heterocyclic groups in the art such that one of ordinary skill, upon viewing the generic formula of Lupo, would have readily envisaged pyrimidine or triazine groups attached to a spirobifluorene moiety.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GREGORY CLARK whose telephone number is (571)270-7087. The examiner can normally be reached on M-Th 7:00 AM to 5 PM Alternating Fri 7:30 AM to 4 PM and Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Larry Tarazano can be reached on (571) 272-1515. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/D. Lawrence Tarazano/
Supervisory Patent Examiner, Art Unit 1786

GREGORY CLARK
Examiner
Art Unit 1786